

A Regional Information Node for Fire Science* in the Pacific Northwest

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Abstract:

We will create a new Web-based node of the National Biological Information Infrastructure (NBII) that serves information on fire science and technology developed by the Joint Fire Science Program (JFSP) and National Fire Plan (NFP). The Fire Information and Research Node (FIRENode) will provide "one-stop shopping" for resource managers, decision makers, scientists, students and local communities who want to examine the results of the current, intensive effort to understand and manage fuels on public lands in the United States. It is critical that fire research programs rapidly make data and associated information available in order to facilitate science-based management and timely solutions for effective large-scale fuel treatments.

As a prototype for a national NBII node, we will initially develop a node for the Pacific Northwest (Washington, Oregon, Idaho) based on all current and past projects funded by the JFSP and NFP. FIRENode will include (1) primary data, (2) metadata, (3) publications, (4) bibliographic information, and (5) links to sources of fire information. Each project will include a section devoted to technology transfer and relevant applications in resource management, as well as an educational component that uses common language and graphics to explain important findings. In cooperation with investigators, we will also develop one or more synthesis products through analysis and meta-analysis of multiple datasets. By institutionalizing prompt reporting of data and metadata in standard formats and making them publicly available on the Web, FIRENode will greatly enhance the value of research and other scientific activities supported by the JFSP and NFP.

Individual Proposing Project:

David L. Peterson, Research Biologist	Date
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Authorized Agency Representative:

Ed DePuit, Program Manager	Date
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* Now referred to as the Northwest Fire Research Clearinghouse (FIREHouse)

Introduction

Project Justification

The Joint Fire Science Program (JFSP) and National Fire Plan (NFP) provide millions of dollars each year to agencies and organizations to assist them in reducing fire hazards across the United States. Technology and information transfer comprises an important aspect of JFSP and NFP scientific activities. Research projects and other activities need to share their results in various formats such as publications, CD-ROMS, datasets, models, and tools. However, while valuable data and tools result from these activities, the information resides across multiple systems in different organizations. A single gateway or node does not currently exist to distribute this information in an effective manner to scientists, resource managers and the general public.

In response to JFSP AFP 2003-4, Task 2, we propose to address this issue by developing a regional information node for fire science (Fire Information and Research Node, FIRENode) to improve the accessibility and organization of research and related tools in a user-friendly system. Accessing, disseminating and applying fire and fuels research results through the Node support the needs of fire and fuel managers as well as wildland fire management planning and implementation activities.

Based on a national effort already underway – the National Biological Information Infrastructure (NBII, <http://www.nbii.gov>) – the Node benefits from existing infrastructure, expertise, and resources available in fire science, information science and computer technology fields. Initially, the project will aggregate and synthesize data and information at a regional scale, building on current efforts of the NBII Pacific Northwest Information Node (PNWIN, <http://pnwin.nbii.gov>). The PNWIN region includes the states of Washington, Oregon and Idaho. This region provides an excellent prototype area because of the potential for extreme fire events such as the Biscuit and Tiller Fires in Oregon in 2002.

FIRENode will assist the JFSP in addressing its mission to meet information and technological support needs for wildland fuels management programs across agencies, to increase access to available information and provide a knowledge base for managers. The information available through this project also will provide a basis for adaptive management decisions to refine and improve fuel management programs to meet land and resource management goals. The prototype Node will develop the methods and processes needed to expand into other regions, with the ultimate goal of building a national Fire Science Information Node.

Project Objectives

The goal of this project focuses on creating a user-friendly fire science information node that provides an effective means to access the wide variety of data and information resources available from the JFSP and NFP to aid scientists, managers, policy makers and the public. Building this Node requires developing several key components concurrently while ensuring an open, collaborative process for the user community to participate in the effort. We will address the following objectives for the Pacific Northwest region:

- Post online all data from funded JFSP and NFP projects (and other projects as available).

- Develop and post online metadata records for all datasets from funded JFSP and NFP projects.
- Post online publications from funded JFSP and NFP projects.
- Post online bibliographic information and proposals from funded JFSP and NFP projects.
- Provide online links to sources of fire science information.

In addition, we will work with scientists, managers, and coordinators of the JFSP and NFP to identify high-profile synthesis and meta-analysis efforts across multiple datasets and projects. This will demonstrate how archiving and posting data lead to analyses and products that have broader inferences and applications. We will also coordinate and link directly with the Fire Research and Management Exchange System (FRAMES, <http://www.frames.gov>) to ensure the broadest possible reporting and discovery of scientific information on fire.

Background

The fire science community comprises a complex network of people and products, especially those activities associated with the JSFP and NFP. An online archive of data and associated information is the current standard for making scientific and management products available, and is a critical capability needed by the JFSP and NFP (PCAST 1998). Participation in the NBII and National Spatial Data Infrastructure (NSDI) is an overarching requirement for all projects that collect data on federal lands or are funded by the federal government (OMB Circular A-16; Executive Order 12906). It also relates directly to new revisions to OMB Circular A-122 and language contained in PL 105-277 that emphasize the need to make public information more widely available.

FIRENode will improve the accountability and credibility of JFSP and NFP science by expanding on existing reporting requirements. For example, the current Deliverables page of the JFSP website (http://www.nifc.gov/joint_fire_sci/deliverables.htm) will be greatly enhanced by making primary data and metadata public. The NFP website (<http://www.fireplan.gov>) does not currently have a deliverables page, so the new Node will be the primary source for communicating the results of scientific activities.

This Node will be an extension of our prior efforts in natural resource informatics, including the Olympic Peninsula Clearinghouse (<http://www.onrc.washington.edu/clearinghouse>) (Norheim et al. 1999), the Pacific Northwest Information Node (PNWIN, <http://pnwin.nbii.gov>), the fire ecology component of PNWIN (<http://pnwin.nbii.gov/fireecology.shtml>), and the development of over 800 metadata records since 1998. Building on concepts previously developed for bibliographic information retrieval by other systems such as the Fire Effects Information System (FEIS, <http://www.fs.fed.us/database/feis>), FIRENode will implement a state-of-the-art search mechanism, making it possible to find existing information quickly and efficiently.

Materials and Methods

The first step of this project will be a two-day workshop of fire scientists, fire managers and information technology specialists from the Pacific Northwest and beyond. This workshop will identify priority components for developing the Node, preferred formats, opportunities for

synthesis across projects, priorities for technology transfer and general usability. We will maintain contact with workshop participants throughout the course of the project and rely on them to be beta-testers of the Node.

It will also be necessary to communicate with the JFSP Program Manager and NFP Coordinators to ensure that we will meet the needs of their programs for communicating data and information. Their assistance in facilitating submission of data and products by investigators to the Node will be needed to ensure compliance with program objectives and legal requirements.

Objective 1 – Post online all data from funded JFSP and NFP projects (and other projects as available).

We will acquire data collected and compiled by investigators for the 28 scientific projects in the Pacific Northwest that are currently funded by the JFSP and NFP. We will initially contact investigators by email and address issues such as standard protocols for data reporting management. We will visit each one personally and assist them as needed to ensure that data are checked for errors and quality assurance. All data will be compiled in Access databases and posted online after review and approval by investigators. We will be sensitive to releasing these data subject to publication of study results, and will not post any proprietary information (e.g., the location of endangered species).

We will also acquire and post other data that are readily available for scientific studies of fire in the Pacific Northwest. For example, we currently have access to several studies of fuel combustion, fire history, prescribed burning, and smoke production for which we can obtain permission to make the data publicly available. A significant dataset that has already been committed to the Node is the Fire Effects database of the National Park Service for the Pacific Northwest. These data have been collected in standard format and can be transferred to the Node relatively quickly.

Objective 2 – Develop and post online metadata records for all datasets from funded JFSP and NFP projects.

We will develop metadata for all submitted data using Federal Geographic Data Committee standards (http://www.fgdc.gov/standards/status/sub5_2.html) for the development of complete documentation. These metadata will use a standard vocabulary and thesaurus to ensure efficient searching of the metadata records and compatibility across the national NBII framework. Links to data and relevant contact information will be provided. A metadata specialist will be responsible for working with investigators to ensure accurate metadata. Metadata records will be posted online after review and approval by investigators. The metadata search tool developed by the NBII will be available for users to access and scan metadata records for key words. This will be accomplished through personal visits by our project staff with each PI; we will compile all the metadata ourselves, requiring minimal effort on behalf of the PIs.

Objective 3 – Post online publications from funded JFSP and NFP projects.

All publications and reports resulting from JFSP and NFP projects will be posted online. These documents will be posted in .pdf and .doc formats, so that they can be readily downloaded by

users. A search tool will allow users to scan the publications for key words and concepts. Other key publications not part of JFSP and NFP projects will also be posted online.

Objective 4 – Post online bibliographic information, proposals and study plans from funded JFSP and NFP projects.

Literature searches, bibliographic compilations and meta-analyses produced by or relevant to JFSP and NFP projects will be posted in .pdf and .doc formats, so that the documents can be downloaded by users. In addition, the original proposals and study plans for funded JFSP and NFP projects will be posted, so that methodology can be shared and evaluated among scientists and resource managers.

Objective 5 – Provide online links to sources of fire science information.

Key links to sources of fire science information (e.g., PNWIN, FEIS, JFSP, NFP, National Interagency Fire Center, Forest Service Research Stations) will provide a broader scope of information for FIRENode users. The links section of the Node will provide the foundation for development of a national gateway for fire science information.

Opportunities for synthesis

Analysis and meta-analysis of data archives leads to broader inferences and "bigger science" than can be attained by any single data set (e.g., GeoMAC Wildland Fire Support, <http://geomac2.cr.usgs.gov/geomac2002>; International Tree-Ring Data Bank, <http://www.ngdc.noaa.gov/paleo/treering.html>; VegBank vegetation plot database, <http://vegbank.nceas.ucsb.edu/vegbank>). Having all the data and products for JFSP and NFP projects provides an opportunity for cooperation by current and new investigators. Unfortunately there is rarely sufficient communication among investigators or sufficient additional funding to facilitate syntheses. Several current JFSP and NFP projects are studying the effectiveness of silvicultural treatments and prescribed burning on fire behavior and spread. As a collective body of knowledge, these data will have more impact if examined concurrently and potentially included in a larger meta-analysis (Gurevitch et al. 1992, Gurevitch and Hedges 1992, Johnson and Curtis 2001, Kopper 2002). Linkages between resources (e.g., fire, forest management, and wildlife habitat) are also gaining prominence in the policy arena, and co-evaluation of these topics will facilitate integration and better understanding of complex ecological and management issues. As more data accumulate, syntheses will become increasingly important as agencies develop science-based strategies for fuel treatments.

We will identify a topic that is conducive to synthesis and meta-analysis, based on similarity of objectives among different projects, robust statistical and quantitative design, high-quality data, and relevance to current scientific and management issues. This will be done in cooperation with scientists and managers from the initial workshop, JFSP and NFP project investigators, and JFSP and NFP Coordinators. We will select an appropriate analytical approach in consultation with a statistician, and develop a team to conduct and publish the analysis.

Furthermore, we will develop a formal collaboration with the FRAMES project, specifically with Dr. Penelope Morgan and Greg Gollberg, the primary developers. We will link directly from the FIRENode website to the FRAMES website, so users can access data and metadata, and our

website will point to relevant features of FRAMES. This collaboration will lead to a more efficient use of financial and human resources and provide a more comprehensive approach to making scientific data and information on fire available.

A sample home page for FIRENode (*not included in this version*) demonstrates simplicity of format and navigation, yet a connection to NBII and other online resources at the national level. We will develop the capacity for dynamic queries of all FIRENode resources based on audiences (operational personnel, researchers, general public, etc) and geospatial context (state, specific fuel type, etc.). The NBII offers a cataloging tool to increase the reliability and effectiveness of searching. This will provide flexibility in searching and make the Node accessible to a broad audience of users. We anticipate that FIRENode will be hosted within the existing NBII framework through the USGS Center for Biological Informatics in Denver for the duration of the project and potentially afterwards depending on the desires and needs of the JFSP and NFP.

Project Team

Personnel	Responsibility
David Peterson – Forest Service, PNW Station, FERA ¹ (contributed effort)	PI, manage project and budget, communicate with fire community, direct synthesis efforts
Jennifer Gaines – USGS NBII Program (contributed effort)	Co-PI, manage project, communicate with all partners, develop linkages with national NBII program and other programs
Karen Kopper – North Cascades National Park (contributed effort)	Co-PI, manage project, acquire National Park Service data, communicate with fire community, conduct meta-analysis of data
Diana Olson – Forest Service, PNW Station, FERA	Coordinate and provide technical oversight of FIRENode, develop and implement the Node, conduct QA/QC of fire data and information, design and write tech transfer components, acquire publications and bibliographic info, write non-technical components and documentation, communicate with fire community
Paige Eagle – Forest Service, PNW Station, FERA	Program web applications, design and maintain web site, manage data structure, ensure server operability, implement Arc-IMS applications
Technical Information Specialist, Forest Service, PNW Station, FERA	Manage data, develop web site content, ensure data protocols, edit technical information, develop metadata records
Ella Elman – College of Forest Resources, University of Washington (contributed effort)	Implement NBII framework and protocols for FIRENode; assist with web applications
Lisa Zolly - USGS NBII Program (contributed effort)	Assist with information science, develop standard vocabulary and thesaurus, act as liaison with Cambridge Scientific Abstracts and other bibliographic sources

¹ FERA = Fire and Environmental Research Applications Team

Computational resources

The Seattle Forestry Sciences Lab has an exceptional computing environment for serving FIRENode. We have a cluster of 22 dual processor 1 GHz computers running the Linux operating system, capable of about 50 billion floating point operations per second. We also have two additional timeshared computers, each with dual 2 Gigahertz microprocessors. Through our

cooperative agreement with the University of Washington, we have a dedicated network connection capable of moving 7.5 million bits per second. We recently upgraded the main fileserving computers, and we have room (and power) to add eight disk drives to two machines. If need be, we can buy 200 Gigabyte drives and expand to 3.2 Terabytes of storage for about \$3000. Note that we have budgeted \$7500 in anticipation of adding this storage, adding a high-end work station, and making other potential hardware purchases.

We have four computer specialists qualified to do system administration. We also have an automated tape library for doing backups without human intervention, and a dedicated firewall to protect some of the machines, while other machines are on a private local area network. All of this computing power sits in a computer room with dedicated power, cooling, and security. So, we have sufficient computing, storage, communications, power, security, backup, and administrative support to execute this project.

Deliverables

- Regional workshop for managers and scientists to set priorities for FIRENode.
- Study plan to JFSP.
- Website (FIRENode) where data, metadata and products from JFSP and NFP will be available online.
- Prototype Node where all JFSP and NFP data, metadata and products can be made publicly available.
- Report and publication on a synthesis of data and information in FIRENode.
- Final report to JFSP.
- Publications in journals and Forest Service series.

Technology Transfer

- FIRENode will function as the key access point for all JFSP and NFP data and information resources in the Pacific Northwest. This framework provides the basis for expanding to other regions and ultimately to the national level.
- The workshop will engage the fire community in planning and contributing to the development of the project.
- Interim reports, fact sheets, and executive summaries will be prepared and distributed to resource managers and others in the fire community as well as governor's offices, state legislatures, and Congressional delegations.
- FIRENode will become an institutionalized component of JFSP and NFP project reporting, thereby facilitating rapid dissemination of results to resource managers, decision makers and the general public.

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